

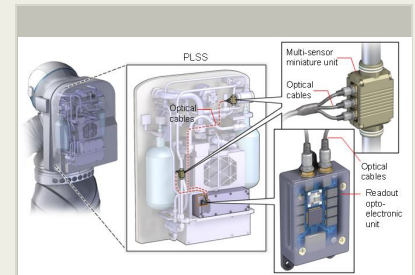
## Advanced Gas Sensing Technology for Space Suits, Phase I

Completed Technology Project (2015 - 2016)



## Project Introduction

Advanced space suits require lightweight, low-power, durable sensors for monitoring critical life support materials. No current compact sensors have the tolerance for liquid water that is specifically required for portable life support systems (PLSS). Intelligent Optical Systems (IOS) will develop a luminescence-based optical sensor probe to monitor carbon dioxide, oxygen, and humidity, and selected trace contaminants. Our monitor will incorporate robust CO<sub>2</sub>, O<sub>2</sub>, and H<sub>2</sub>O partial pressure sensors interrogated by a compact, low-power optoelectronic unit. The sensors will not only tolerate liquid water but will actually operate while wet, and can be remotely connected to electronic circuitry by an optical fiber cable immune to electromagnetic interference. For space systems, these miniature sensor elements with remote optoelectronics give unmatched design flexibility for measurements in highly constrained volume systems such as PLSS. Our flow-through monitor design includes an optical sensor we have already developed for PLSS humidity monitoring, and an optical oxygen sensor, both of them based on a common IOS technology. In prior projects IOS has demonstrated a CO<sub>2</sub> sensor capable of operating while wet that also met PLSS environmental and analytical requirements, but did not meet life requirements. A new generation of CO<sub>2</sub> sensors will be developed to advance this sensor technology and fully meet all NASA requirements, including sensor life. The totally novel approach will overcome the limitations of state-of-the-art luminescent sensors for CO<sub>2</sub>. Additional sensors will be developed to monitor trace contaminants often found in the ventilation loop as result of material off-gassing or crew member metabolism. IOS has established collaboration with UTC Aerospace Systems to produce prototypes for space qualification, and will conduct extensive testing under simulated space conditions, ensuring a smooth path to technology infusion.



Advanced Gas Sensing Technology for Space Suits, Phase I

## Table of Contents

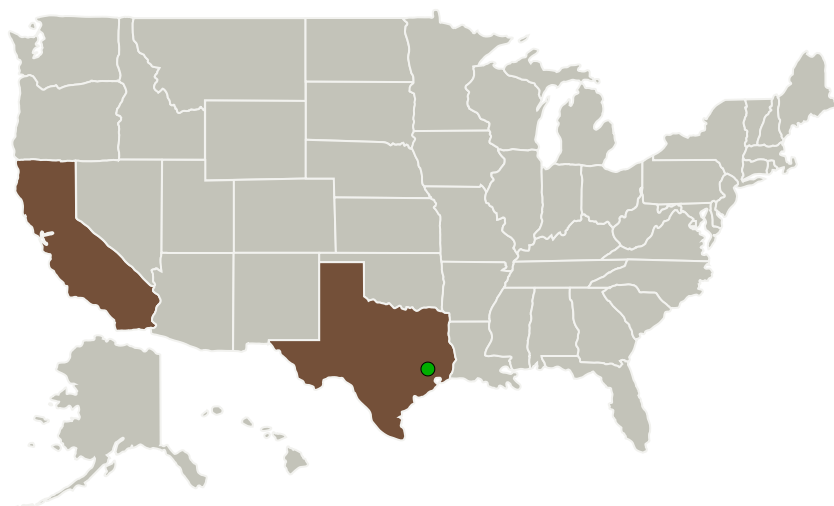
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Images	3
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

## Advanced Gas Sensing Technology for Space Suits, Phase I

Completed Technology Project (2015 - 2016)



## Primary U.S. Work Locations and Key Partners




Organizations Performing Work	Role	Type	Location
Intelligent Optical Systems, Inc.	Lead Organization	Industry	Torrance, California
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
University of North Texas	Supporting Organization	Academia	Denton, Texas

## Primary U.S. Work Locations

California	Texas
------------	-------

## Project Transitions

 **June 2015:** Project Start

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Intelligent Optical Systems, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Jesus D Alonso

**Co-Investigator:**

Jesus Delgado Alonso

# Advanced Gas Sensing Technology for Space Suits, Phase I



Completed Technology Project (2015 - 2016)

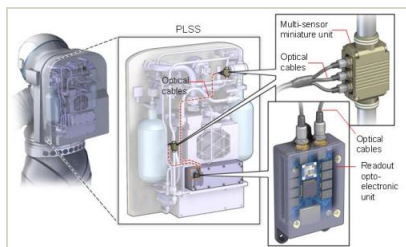
✓ **June 2016:** Closed out

**Closeout Summary:** Advanced Gas Sensing Technology for Space Suits, Phase I Project Image

**Closeout Documentation:**

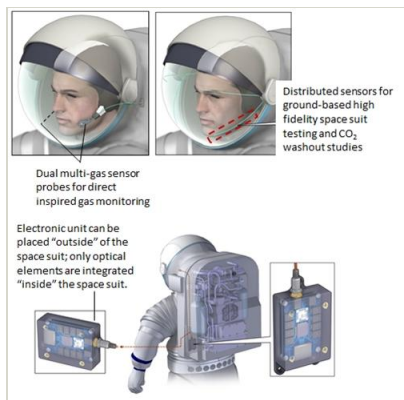
- Final Summary Chart Image(<https://techport.nasa.gov/file/138670>)

## Images



### Briefing Chart Image

Advanced Gas Sensing Technology for Space Suits, Phase I  
(<https://techport.nasa.gov/image/131963>)

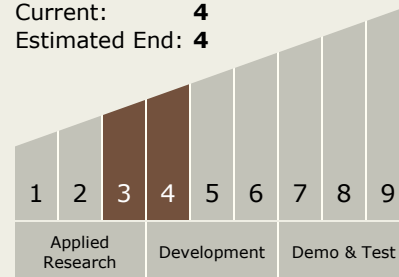


### Final Summary Chart Image

Advanced Gas Sensing Technology for Space Suits, Phase I Project Image  
(<https://techport.nasa.gov/image/128746>)

## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.2 Portable Life Support System

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System